

WHAT IS CLAIMED IS:

1. A bandwidth allocation device for an Ethernet Passive Optical Network (EPON) including an optical line termination (OLT), an optical distribution network (ODN), and a plurality of optical network units (ONU),

wherein the optical line termination includes a Multi-Point Control Protocol (MPCP) allocator, and the optical network unit includes an MPCP requester,

said MPCP allocator including:

a class-based queue state counter which differentiates the optical network unit, upon receipt of a control message for upstream report (REPORT) from a Medium Access Control (MAC) control layer, and obtains class-based queue length information of the optical network unit; and

a grant generator which, when queue state information of all the optical network units is obtained through the class-based queue state counter, generates a service-based bandwidth for each of the optical network units, and transmits a control message for upstream bandwidth allocation(GATE),

said MPCP requester including:

a class-based buffer counter which counts a class-based buffer length, upon receipt of the control message for upstream bandwidth allocation from the grant generator; and

a request generator which generates class-based buffer

length information, and transmits the control message for upstream report containing the generated buffer length information.

5 2. The bandwidth allocation device as set forth in claim 1, wherein the downstream control message as a grant of an upstream bandwidth request includes a grant level, a grant length, and a start time of a timeslot as a sum of a plurality of grant values of upstream slot bandwidth.

10 3. The bandwidth allocation device as set forth in claim 2, wherein the control message for upstream report includes a queue level, and a queue report as a sum of a plurality of queue state reports.

15 4. A dynamic bandwidth allocation method for an Ethernet Passive Optical Network (EPON) including an optical line termination (OLT), an optical distribution network (ODN), and a plurality of optical network units (ONU), the method comprising:

20 a first step of, upon receipt of a control message for upstream report from the optical network unit, checking which ONU's information is contained in the received control message, and updating a bandwidth;

25 a second step of, when a sum of bandwidths for HP (High

Priority) of all ONUs is more than a link capacity, allocating a bandwidth proportional to the bandwidth for HP of each of the ONUs to each of the ONUs in the same order as a previously allocated order of ONUs, if there is a previously allocated order of ONUs;

a third step of, when the sum of bandwidths for HP (High Priority) of all ONUs is less than the link capacity, allocating a bandwidth equal to the bandwidth for HP to each of the ONUs;

a fourth step of, when a sum of the bandwidths for HP and MP (Medium Priority) of all ONUs is more than the link capacity, using a bandwidth remaining after the allocation for the bandwidths for HP to additionally allocate a bandwidth proportional to the bandwidth for MP of each of the ONUs to each of the ONUs;

a fifth step of, when the sum of the bandwidths for HP and MP of all ONUs is less than the link capacity, using a bandwidth remaining after the allocation for the bandwidths for HP to additionally allocate a bandwidth equal to the bandwidth for MP of each of the ONUs to each of the ONUs;

a sixth step of, when a sum of maximum bandwidths of all ONUs is more than the link capacity, using a bandwidth remaining after the allocation for the bandwidths for HP and MP to additionally allocate a bandwidth proportional to the bandwidth for LP (Low Priority) of each of the ONUs to each of

the ONUs; and

a seventh step of, when the sum of the maximum bandwidths is less than the link capacity, allocating an additional bandwidth to each of the ONUs so that a total bandwidth allocated to each of the ONUs is equal to the maximum bandwidth of each of the ONUs, and equally dividing a bandwidth remaining after the bandwidth allocation for the maximum bandwidth to be additionally allocated as a bandwidth for LP to each of the ONUs.

5. The dynamic bandwidth allocation method as set forth in claim 4, wherein the first step is performed in such a manner that, when the control message for upstream report is received from the optical network unit, it is checked which ONU's information is contained in the received control message, and a request bandwidth for HP, which corresponds to queue length information for HP/update period, is updated, and a request bandwidth for MP, which corresponds to queue length information for MP/update period, is updated, and a request bandwidth for LP, which corresponds to queue length information for LP/update period, is further updated.

6. The dynamic bandwidth allocation method as set forth in claim 4, wherein

the high priority service is a service having

requirements of end-to-end delay and jitter of the services of the ONUs,

the medium priority service is a service which is sensitive to the delay but requires a predetermined bandwidth,
5 and

the low priority service is a BETC (Best Effort Traffic Class) service which has no requirement of end-to-end delay and jitter, and is assigned a marginal bandwidth.

10 7. A computer-readable recording medium enabling a computer to performs:

a first step of, upon receipt of a control message for upstream report, checking which ONU's information is contained in the received control message, and updating a bandwidth;

15 a second step of, when a sum of bandwidths for HP of all ONUs is more than a link capacity, allocating a bandwidth proportional to the bandwidth for HP of each of the ONUs to each of the ONUs in the same order as a previously allocated order of ONUs, if there is a previously allocated order of
20 ONUs;

a third step of, when the sum of bandwidths for HP of all ONUs is less than the link capacity, allocating a bandwidth equal to the bandwidth for HP to each of the ONUs;

a fourth step of, when a sum of the bandwidths for HP
25 and MP of all ONUs is more than the link capacity, using a

bandwidth remaining after the allocation for the bandwidths for HP to additionally allocate a bandwidth proportional to the bandwidth for MP of each of the ONUs to each of the ONUs;

a fifth step of, when the sum of the bandwidths for HP and MP of all ONUs is less than the link capacity, using a bandwidth remaining after the allocation for the bandwidths for HP to additionally allocate a bandwidth equal to the bandwidth for MP of each of the ONUs to each of the ONUs;

a sixth step of, when a sum of maximum bandwidths of all ONUs is more than the link capacity, using a bandwidth remaining after the allocation for the bandwidths for HP and MP to additionally allocate a bandwidth proportional to the bandwidth for LP of each of the ONUs to each of the ONUs; and

a seventh step of, when the sum of the maximum bandwidths is less than the link capacity, allocating an additional bandwidth to each of the ONUs so that a total bandwidth allocated to each of the ONUs is equal to the maximum bandwidth of each of the ONUs, and equally dividing a bandwidth remaining after the bandwidth allocation for the maximum bandwidth to be additionally allocated as a bandwidth for LP to each of the ONUs.